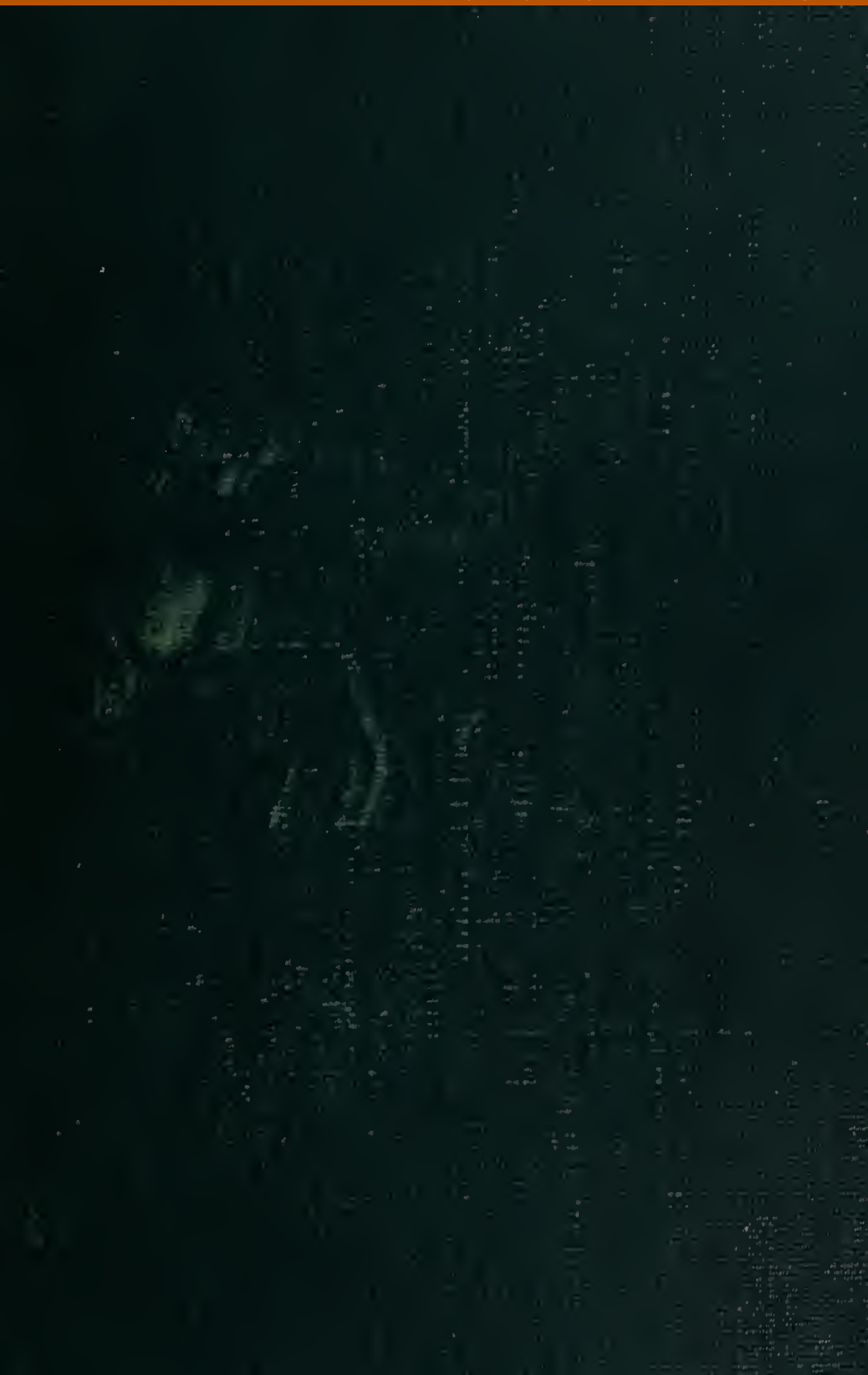

STATE OF ILLINOIS
DEPARTMENT OF REGISTRATION AND EDUCATION
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REPORT OF INVESTIGATIONS—NO. 3

PRELIMINARY REPORT OF

AN INVESTIGATION OF THE MOLDING SAND RESOURCES OF ILLINOIS

BY
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IN COOPERATION WITH THE ENGINEERING EXPERIMENT STATION OF THE UNIVERSITY OF ILLINOIS

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By M. S. Littlefield

OUTLINE

TABLES

INTRODUCTION

An investigation of the molding sand resources of Illinois was recommended to the Illinois Geological Survey by the Joint Committee of the American Foundrymen's Association and the National Research Council as a part of their program to secure data on the molding sand resources of the important foundry states of the Union. Illinois which ranks third in the production of molding sand and fifth in the number of foundries is of considerable importance both as a producer and as a consumer. There are 490 active foundries of all types in the State.[1] Much of the production is silica sand for steel founding, a branch of production which is well established. The production of molding sand for the years 1922 and 1923 was as follows:

	Steel sand	Natural bonded sands	Total	Natural bonded sand
	Tons	*Tons*	*Tons*	*Per cent*
1922.....	546,765	107,996	654,761	16.5
1923.....	647,963	150,720	798,683	18.9

Visits to foundries showed that considerable sand is shipped in from outside the State. For the foundries visited in Chicago more than 50 per cent of the sand was imported and for those located elsewhere in the State approximately 10 per cent was obtained outside Illinois. Of the State's 490 foundries, 200 are located in Chicago. If the percentages given above hold true, about one-fourth of the natural bonded molding sand used within Illinois is obtained from other states. It is probable that the greater part of the sand shipped in is fine sand.

The resources of commercial natural bonded molding sand are estimated to approximate at least 6,000,000 tons exclusive of the sands of the St. Peter formation, and of the limy yellow silts known geologically as loess in the western part of the State.

[1]The Foundry, p. 801, October 15, 1924.

There are several million tons available in the Wabash valley at points three to five miles from railroads which were not sampled nor included in the estimates as being commercial.

The sand resources of the State may be roughly divided into two classes:—(a) the fine, and (b) the medium and coarse sands. The latter are abundant and probably will furnish a sufficient supply for many years. The fine sands, that is, those which are of usable quality, are not so abundant. The loess or the calcareous yellow silt, which is found in such abundance along the bluffs of Mississippi River and for some miles to the east, does not seem to be worthy of consideration as a competitor for lime-free sands of the same texture. It is used for some purposes and it is regretful that because of its abundance and uniformity it cannot be further utilized.

METHOD OF INVESTIGATION

Field Work

GENERAL STATEMENT

Field work was carried on from June 18 to September 15, 1923. Eighty-five counties of the 102 counties of the State were studied, those omitted being counties from which there has been no production reported and whose geological conditions indicate that they are barren territory. A total of 139 samples was collected and tested, 57 from producing pits, 42 from new deposits, and 40 from foundries. The 40 samples collected from foundries included 24 Illinois sands and 16 foreign sands. All the known producing pits in Illinois were visited. Twenty-nine new deposits of commercial promise were found and sampled.

In order that the study should be conducted as nearly as possible from the viewpoint of the foundryman, 40 foundries were visited in Chicago, Peoria, East Moline, Rock Island, East St. Louis, Quincy and other cities. A study was made of foundry practice, information was obtained regarding their molding sand problems, data were secured on sand production in Illinois and importation from other states, and samples of sands, which had been found to be satisfactory from the stand-

point of actual foundry practice, were collected with a view to testing these and using the results for checking the quality of "unknown" sands.

SAMPLING METHODS

Samples of molding sand were obtained from three general sources—the foundry bins, from pit sections or partially loaded cars at the pits, and from dug sections of undeveloped outcrops. Samples taken from cars were selected from various parts of the car and carefully mixed. These included produced grades. A few produced grades were taken from the pit section, care being taken to include exactly that part of the section being dug. Most samples mixed from pit sections are called possible grades as there is sufficient sand in position to produce a like grade. There are, however, some types of deposits which are so variable that large quantities of a given grade are difficult to obtain.

The producers' grade classification is given in Tables 1 and 2 only in case the producer definitely stated that the grade was standard. Also it cannot be assumed that all produced grades or possible grades can be produced so that test results would be exactly the same as those given in this report. In order that sands can be bought on a basis of standard tests, they must be produced by controlled methods and purchasing plants must observe a reasonable degree of tolerance. A discussion of types of sands will be included in the forthcoming more detailed report on the molding sand resources of the State by the Illinois Geological Survey.

Laboratory Work

The testing of the samples collected during the summer of 1923 was done cooperatively during the summer of 1924 by the Engineering Experiment Station of the University of Illinois and the Illinois Geological Survey, in the foundry laboratory of the department of Mechanical Engineering. The equipment in this laboratory is as specified in the Standard Test Procedures recommended by the American Foundrymen's Association and the results are therefore comparable with the results of other organizations using the standardized tests. In addition, base permeability tests, with the clay removed, were made on all the

sands, and durability tests which gave the percentage of a bond strength lost by heating for two hours at a temperature of 600 degrees Fahr., were made on 48 sands.

ACKNOWLEDGMENTS

The success of this scientific study has been dependent in large measure on the interest and cooperation of the molding sand producers and foundrymen of the State. Attention given by the Chicago Foundrymen's Association and the Quad City Foundrymen's Association enabled the visitation of more plants than would have been otherwise possible.

Dr. M. M. Leighton, Chief of the State Geological Survey, was in constant touch with the work, and his detailed knowledge of the glacial deposits of northern Illinois made possible a systematic survey of difficult areas; Mr. L. F. Athy, of the University of Chicago, ably assisted in the field work; Mr. B. W. Benedict, Manager of the Shop Laboratory, provided full laboratory facilities; Mr. R. E. Kennedy, assistant secretary of the American Foundrymen's Association, gave helpful advice during both field and laboratory work; Professor C. W. Parmelee, Head of the Department of Ceramics, extended aid in pursuing experimental work on heat tests; Mr. H. W. Dietert, Sand Technologist of the United States Radiator Corporation, Detroit, suggested practical test procedures from his own experience; and in the laboratory, Mr. R. S. Datta and Mr. B. F. Nordmann of the University of Illinois were helpful assistants by reason of their scientific interest.

RESULTS OF TESTING

Introduction

Tables 1 and 2 contain in summary form the results of testing the entire number of samples. The tests for fineness, permeability, and bond were carried on in accordance with recommendations of the American Foundrymen's Association.[2] Tests for

[2]Tentatively adopted methods of tests and resumé of activities of the Joint Committee on Molding Sand Research. American Foundryman's Association bulletin, June 1, 1924 (Corrected edition).

durability and base permeability were made with a view to presenting results of possible practical value to foundrymen. These results should stimulate work which will check their value as practical and feasible tests. Modifications of the methods might well be made but it is desirable in all cases to use as much of the standard test apparatus and ordinary foundry equipment as possible.

Durability Test

VALUE

A need for a test of the durability of molding sand has been evident, as a sand which has a low degree of durability may not be profitably used even though the fineness, permeability and cohesiveness tests indicate its suitability. The problem of durability, or life of a sand, is distinct from the problem of refractoriness or resistance to fluxing, as it is conceivable that a very refractory sand might be short lived. The general procedure of durability tests developed and used in plant control work by H. W. Dietert was adopted after some experimentation with temperatures at 500 degrees, 600 degrees, 1000 degrees to 1250 degrees, and 1800 degrees Fahr. A temperature of 600 degrees Fahr., which is that used by Mr. Dietert, was found to be best suited for obtaining results apparently indicative of durability. Lower temperatures gave little differentiation between sands, and temperatures above 1000 degrees appeared to dehydrate so much of the clay substance that the bond strength was due largely to interlocking of grains and possibly some adhesion between grains which had burnt on coats of "dead" clay. At 1800 degrees the bond strength was entirely lost in the few samples tested at that temperature.

The foundry problem of durability relates to the partially burnt sand which goes back into the heap and not to the sand which is entirely burnt out and discarded. Hence it is desirable to know the loss of bond strength at low temperatures. Such a test is largely an aid in gaging the durability of new sand.

GENERAL PROCEDURE

Three pounds of untested, air dried sand broken up to pass a No. 6 riddle, is put into a sheet iron or aluminum pan

of such size that the sample may be spread evenly in a layer about one-fourth of an inch thick. The sand is placed in a gas core oven which is heated until a given shelf reaches 600 degrees Fahr. and a thermo couple laid on top of the sand. Uniform temperature is maintained for two hours, a tolerance of 15 degrees Fahr. being allowed after the sand reaches 600 degrees Fahr. After being removed from the oven, the sand is spread in a thin layer on an iron core bench and allowed to cool for two hours. It is then tempered to the optimum water content for bond strength and allowed to temper for twenty-four hours. The test for bond strength is made in accordance with the procedure of the standard cohesiveness test. The difference between the bond strength of the heated sample and the bond strength at optimum water content of the usual sample is the loss which is best stated as percentage of the maximum bond strength of the sample.

The durability bond test figures given in Tables 1 and 2 were obtained at the optimum water content as shown by the usual test. Quite probably the optimum water content changes somewhat on heating and although no specific data can be advanced in support, it seems probable that excessively high or excessively low bond strength losses may be due in part to migration of the optimum water content. The weight of this factor must be established or eliminated before a test showing low durability be condemned or one showing a high durability or a slight gain be accepted with full confidence. Foundry practice is the final judge in weighing the value of any test and a check by plant control men on the life of the sands in present use would be of considerable advantage.

Base Permeability

VALUE

Base permeability tests were found to be of practical value by H. W. Dietert in furnishing data on the tendency of certain sands to open or close a heap. The natural permeability of the sand, that is, the permeability when tempered for use, gives little

or no indication as to the effect of the sand grains upon the permeability of a heap after all or a part of the clay is burnt out. The variations of base permeability from natural permeability are striking in some cases. Correlation of such results with the action of a sand in the heap is the final criterion of the value of these data. It seems that, like the durability test, this test is most valuable in testing new sands.

GENERAL PROCEDURE

Approximately three hundred grams of sand are treated in the same manner as for the fineness test, in order to eliminate the clay. The dried sand is poured through a funnel into a two-inch glass tube, upon which is a mark indicating the volume of sand that forms a two-inch column when rammed in the permeability cylinder. The quantity of sand necessary varies slightly with certain sands according to their degree of compaction. A screen, 200-mesh for fine samples and 100-mesh for coarser samples, is used in the end of the permeability cylinder. The sand in the glass tube must be examined for bedding into laminæ of various sized grains, particularly the silt and serves as an indicator of the difficulty involved in obtaining a uniform mix of all grades. The sand is poured evenly from the glass tube into the permeability cylinder. Some sorting is inevitable with some sands and experience will teach a rate of pouring that will minimize this error. Care must be taken not to jar or "shake down" the sample before ramming. A screen on the upper surface is advisable. The permeability is obtained by the standard method. The sand is returned to the original receptacle and another sample, taken from the remixed total sample, is tested. Sorting of grain sizes by pouring the sand into the cylinder is a serious difficulty and may produce a silt layer which is more impermeable than the sample as a whole. A check as definite as is obtained in natural permeability tests is seldom possible, if the same tolerance of height of sand cylinder is used. At least five runs should be made to obtain a fair average.

CONCLUSIONS

Results showed that the silt grade is the most important of the factors governing base permeability. It is probable that there is a "saturation point" at which the material on 270-mesh and through 270-mesh occurs in sufficient quantity to fill all the interstices between the larger grains. Such a point is high if the sand is coarse, well sorted and rounded in shape, and lower if several grades of angular sand are present. If the silt does not completely fill the interstices, the sand may be as open or more open than when tempered. However, if the silt does fill all the interstices, the sand will probably be less permeable than when tempered. Probably no practical mathematical method for computing base permeability from the grain size grade percentages can be devised. However, after some experience, it is entirely possible that a general prediction of a high or low base permeability might be determined from the fineness test data. The only way to be certain is to make the test, which can be made at the same time as the fineness test.

DESCRIPTION OF MOLDING SAND DEPOSITS IN ILLINOIS

Adams County

Sample No. 139: NE. 1/4 NW. 1/4 sec. 26, T. 1 S., R. 9 W. One-fourth mile north of Chicago, Burlington and Quincy siding. Sample taken from bin of Electric Wheel Company, Quincy, Illinois. From producing pit worked by J. A. Platt, Quincy, Illinois. Used for light gray iron and for bond renewal. Three- to seven-foot section. Extent, 20,000 to 100,000 tons. Formation, wind blown silt or loess, capping east valley wall of Mississippi River. A calcareous sand containing primarily deposited bond.

Bond County

Sample No. 52: Location same as No. 171. Sample taken from bin of Greenlee Brothers, Rockford, Illinois. Used for heavy castings.

Sample No. 53: Location same as No. 171. Sample taken from bin of Greenlee Brothers, Rockford, Illinois. A finer grade than No. 52. Used for medium heavy castings. Mixes made of No. 52 and No. 53 to suit grade of work.

Sample No. 100: Location same as No. 168. Sample taken from bin of Frank Foundries, Moline, Illinois. Used for very heavy castings. Trade name, Greenville Coarse.

Sample No. 166: NW. 1/4 NE. 1/4 sec. 25, T. 4 N., R. 2 W. One and one-half miles east of Tamalco siding, Chicago, Burlington and Quincy Railroad. Worked by G. Nicol and Son, Collinsville, Illinois. Production for heavy gray iron work. Sample mixed in pit. Half and half mixture of heavy top sand and sharp basal sand. Extent, 100,000 to 280,000 tons. Formation, Illinoian fluvio-glacial sands containing weathered bond.

Sample No. 167: Location same as No. 166. Sample of produced grade from 7-foot pit section. Shipped for heavy gray iron work.

Sample No. 168: SW. 1/4 NE. 1/4 sec. 1, T. 5 N., R. 2 W. One and one-half miles south of Mulberry Grove siding of Vandalia Railroad. Worked by Warren Sand Company, Mulberry Grove, Illinois. Production for heavy gray iron work. Sample taken from two partially loaded cars. Pit section 7 to 9 feet. Extent, 100,000 to 200,000 tons. Formation, Illinoian fluvio-glacial sands containing weathered bond.

Sample No. 170: E. 1/2 SW. 1/4 sec. 10, T. 5 N., R. 3 W. One-half mile northwest of Greenville siding of Vandalia Railroad. Worked by W. M. Peterson and Sons, Greenville, Illinois. Production for heavy gray iron work. Pit section 3 to 8 feet. Sample of produced grade taken from partially loaded cars. Extent, 120,000 to 200,000 tons. Formation, Illinoian fluvio-glacial sands containing weathered bond.

Sample No. 171: S. 1/2 SW. 1/4 sec. 2, T. 5 N., R. 3 W. One and one-fourth miles north of Greenville siding of Vandalia Railroad. Worked by Ed. E. Squier Company, Federal Reserve Bank Building, St. Louis, Missouri. Production for heavy gray iron work. Sample from several channels in total 7-foot pit section. Extent, 100,000 to 300,000 tons. Formation, Illinoian fluvio-glacial sand containing weathered bond.

Sample No. 179: Location same as No. 166. Sample taken from bin of Enterprise Foundry Company, Belleville, Illinois. Used for heavy gray iron work.

Boone County

Sample No. 43: Center E. 1/2 sec. 26, T. 45 N., R. 4 E. Three miles south of Capron Station of Chicago and Northwestern Railroad. Unworked deposit. Owner's name unknown. Sample from several channels in total 3-foot section exposed in creek bank. Extent, 20,000 to 40,000 tons. Locality favorable for similar deposits. Formation, stream terrace deposit. Sand contains weathered bond.

Bureau County

Sample No. 113: SW. 1/4 sec. 21, T. 16 N., R. 8 E. One mile southeast of Wyanet sidings of the Chicago, Rock Island and Pacific and the Chicago, Burlington and Quincy railroads. Worked by Golden and Larson, Wyanet, Illinois. Sample from several channels of 3- to 4-foot pit section. Same as produced grade. Used for light and medium gray iron work. Extent of deposit, 160,000 to 400,000 tons. Formation, wind blown sand containing weathered bond. Mantled by 1 1/2 feet of leached silty clay, a part of which is added to increase bond. Produced sand a combination of weathered bond and primary bond sand.

Sample No. 114: NE. 1/4 NE. 1/4 sec. 32, T. 16 N., R. 7 E. One and one-half miles northwest of Buda siding of Chicago, Burlington and Quincy Railroad and one-fourth mile west of Chicago and Northwestern Railroad. Producing pit worked by Mr. Lay, Buda, Illinois. Sample taken from several channels of 3 1/2-foot pit section. Similar to produced grade. Sand used for light and medium gray iron work. Extent, 40,000 to 200,000 tons. Formation, wind blown sand containing weathered bond. Capped by one-foot layer of silty clay. Very little top clay added to this sample.

Sample No. 115: Location same as No. 114. Sample taken from loaded car. A heavier grade than No. 114, produced from same weathered bond sand in addition to the silty clay capping.

Sample No. 116: NW. 1/4 sec. 35, T. 16 N., R. 7 E. One mile east of Buda siding of Chicago, Burlington and Quincy Railroad. Worked by Jesse Westervilt, Buda, Illinois. Sample of produced grade, taken from several channels in 3-foot pit section. Used for medium gray iron work. Extent, 60,000 to 90,000 tons. Formation, wind blown sand containing weathered bond. Capped by one foot of leached silty clay. Practically no clay added to sample. Heavier grades may be produced by addition of silty clay.

Sample No. 117: Location same as No. 116. Sample taken from single hole dug into upper two feet of 3 1/2-foot section 200 yards from pit face. Similar in texture to No. 116.

Cass County

Sample No. 138: Location same as No. 143. Sample taken from bin of Electric Wheel Company, Quincy, Illinois. Used for medium gray iron.

Sample No. 143: Sec. 20, T. 17 N., R. 11 W. One-half mile to Arenzville siding of Chicago, Burlington and Quincy Railroad. Worked by G. Nicol and Son, Collinsville, Illinois. Sample from several channels in coarsest phase. A possible grade. Extent of entire deposit 50,000 to

120,000 tons. Formation, wind blown sand containing weathered bond. Mantles lower portion of slope of east valley wall of Illinois River. Some parts of section contain finer and coarser material interbedded and hence some produced sands are combinations of weathered bond and primary bond sands. The primarily bonded fine sands and silts which occur high on the slope are calcareous.

Sample No. 144: Location same as No. 143. Sample taken from several channels of finest producible sand seen in this pit. Sold for light gray iron and stove plate.

Sample No. 145: Location same as No. 143. A different pit face with a 5 1/2-foot section. Upper 4 feet lime-free; lower 1 1/2 feet contain lime concretions. Whole pit face worked for produced grade. Sample taken from several channels in upper 4 feet of section.

Sample No. 146: Location same as No. 143. Sample from lower 1 1/2 feet of pit section noted under No. 145 is very calcareous and of no value for molding sand. This part of section should be kept out of produced grades.

Sample No. 147: NE. 1/4 NW. 1/4 sec. 27, T. 18 N., R. 11 W. One-eighth mile east of Bluff Springs siding of Chicago, Burlington and Quincy Railroad. Unworked deposit. Owner's name not known. Sample taken from several channels in 2- to 4-foot section exposed in roadcut. Extent 14,000 to 35,000 tons. Origin of sand same as deposit listed under No. 143. Finer textural phases shown. Sample is mixture of some weathered bond sand with much primary bond sand. Such a mix gives low permeability.

Sample No. 177: Location same as No. 143. Sample taken from bin of Eagle Foundry Company, Belleville, Illinois. Used for stove plate.

Clinton County

Sample No. 197: No data on location. Sample sent in by Erne H. Duckman, Keyesport, Illinois.

Cook County

Sample No. 10: NE. 1/4 SW. 1/4 sec. 9, T. 42 N., R. 9 E. Five miles southwest of Barrington. Unworked deposit. Owner, Henry Louis. Sample taken from several channels of total 3-foot section. Overlain by 3 to 4 feet of sharp sand. Extent, 12,000 to 20,000 tons. Locality favorable for similar deposits. Formation, wind blown sand, capping hilltop. Contains weathered bond.

Fayette County

Sample No. 37: Location same as No. 164. Sand from same part of deposit as No. 164. Sample taken from bins of National Malleable Company, Chicago, Illinois. Used for heavy castings.

Sample No. 161: SW. 1/4 SW. 1/4 sec. 32, T. 7 N., R. 1 E. Adjacent to siding on spur of Illinois Central Railroad. Unworked deposit. State Prison Farm, Vandalia, Illinois. Sample from single channel of total 9-foot section. Extent, 50,000 to 200,000 tons. Formation, Illinoian fluvio-glacial sands containing weathered bond.

Sample No. 162: Location same as No. 161. Sample from several channels in upper 5 feet of total 9-foot section.

Sample No. 163: SW. 1/4 NW. 1/4 sec. 32, T. 7 N., R. 1 E. One-eighth mile from siding of Illinois Central Railroad. Worked by P. and H. McKinney Company, Vandalia, Illinois. Sample is pit run from 15-foot section. Extent, 240,000 to 600,000 tons. Sand used for heavy gray iron work. Formation, Illinoian fluvio-glacial sands containing weathered bond.

Sample No. 164: SE. 1/4 NE. 1/4 sec. 14, T. 6 N., R. 1 E. One-half mile southwest of Bluff City siding of Vandalia Railroad. Worked by Eugene Stultz, Mulberry Grove, Illinois. Produced for medium gray iron work. Sample from several channels in 3-foot section. Extent, 20,000 to 100,000 tons. Formation, wind blown sand capping east valley wall of Kaskaskia River. Contains weathered bond.

Sample No. 165: Location same as No. 164. Produced for heavy gray iron work. Sample taken from several channels in lower 5 feet of 9-foot section. Upper 4 feet extremely heavy sand. Extent, 80,000 to 380,000 tons. Formation, Illinoian fluvio-glacial sands containing weathered bond. Exposed in bluff at lower elevation than deposit from which No. 164 was taken.

Sample No. 169: SW. 1/4 NE. 1/4 sec. 32, T. 6 N., R. 1 W. Two miles east of Mulberry Grove, one-half mile east of siding on Vandalia Railroad. Worked by Coarse Red Molding Sand Company, Mulberry Grove, Illinois. Sample of produced grade, taken from partially loaded cars. Production for heavy gray iron work. Pit section 7 to 10 feet. Extent, 52,000 to 100,000 tons. Formation, Illinoian fluvio-glacial sands containing weathered bond.

Gallatin County

Sample No. 190: S. 1/2 sec. 21, T. 9 S., R. 9 E. One mile east of Junction sidings of Louisville and Nashville and Baltimore and Ohio railroads. Unworked deposit. Owner's name unknown. Sample taken from several channels in upper 2 feet of total 6-foot section, exposed in roadcut. Extent of this grade 40,000 to 200,000 tons. Locality favorable for other deposits. Formation, wind blown sands mantling west slope of Shawneetown Hills. Sands contain weathered bond.

Sample No. 191: Location same as No. 190. Sample taken from lower 4 feet of total 6-foot section. Directly underlies No. 190. Extent of this grade 80,000 to 500,000 tons.

Hancock County

Sample No. 137: W. 1/2 NE. 1/4 sec. 2, T. 7 N., R. 7 W. One-eighth mile east of Dallas City siding of Santa Fe Railroad. Worked by Purity Molding Sand Company, Dallas City, Illinois. Sample taken from partially loaded car. Grade "No. 2." Extent, 12,000 to 20,000 tons. Formation, wind blown sands and silt on slope of east valley wall of Mississippi River.

Sample No. 149: Same location as No. 137. Sample taken from bin of Brass Foundry Company, 711 S. Adams St., Peoria, Illinois. Used for brass work.

Henderson County

Sample No. 86: Location same as No. 133. Sample taken from bin of Marseilles Plant, East Moline, Illinois. Used for medium gray iron work.

Sample No. 101: Location same as No. 133. Sample taken from bin of Frank Foundries, Moline, Illinois. Used for medium gray iron work.

Sample No. 128: NW. 1/4 NE. 1/4 sec. 15, T. 10 N., R. 5 W. One-fourth mile east of Gladstone siding of Chicago, Burlington and Quincy Railroad. Worked by W. H. Graham. Total pit section 16 feet. Sample taken from lower 5 feet of section. Slightly calcareous. Extent, 16,000 to 50,000 tons. Formation, wind blown silt capping east valley wall of Mississippi River. Contains primarily deposited bond.

Sample No. 130: W. 1/2 SE. 1/4 sec. 16, T. 10 N., R. 5 W. One mile south of Gladstone siding of Chicago, Burlington and Quincy Railroad. Worked by J. T. Galbraith. Sample from partially loaded car. Section 3 to 5 feet worked. Used for gray iron and brass. Extent, 24,000 to 50,000 tons. Formation, slope wash deposited at base of east valley wall of Mississippi River.

Sample No. 131: E. 1/2 sec. 11, T. 10 N., R. 5 W. On siding of spur of Chicago, Burlington and Quincy railroad. Worked by Monmouth Stone Company. Sample taken from several channels in total 4-foot pit section. Extent, 5,000 to 15,000 tons. Formation, wind blown sands and silts on hilltops adjacent to Mississippi Valley.

Sample No. 132: NW. 1/4 SE. 1/4 sec. 20, T. 10 N., R. 5 W. Two miles southwest of Gladstone siding of Chicago, Burlington and Quincy Railroad. Unworked deposit. Owner's name unknown. Sample taken from several channels in 2- to 3-foot section. Extent, 3,000 to 8,000 tons. Locality favorable for similar deposits. Formation, wind blown sand in dune on valley flat of Mississippi River. Contains weathered bond.

Sample No. 133: S. 1/2 NW. 1/4 sec. 31, T. 8 N., R. 6 W. Two and one-half miles east of Dallas City siding of Santa Fe Railroad

Worked by Purity Molding Sand Company, Dallas City, Illinois. Sample from 2 1/2-foot pit section used to produce grade "No. 2 open." Extent of whole deposit 30,000 to 80,000 tons. Formation, wind blown sands and silts on slope of east valley wall of Mississippi River. Sample is combination of weathered bond and primary bond sands interbedded in the section.

Sample No. 134: Location same as No. 133. Sample taken from 2-foot pit section used to produce grade "No. 1 open." Formation, same as No. 133. A less silty section.

Sample No. 142: Location same as No. 131. Sample taken from bin of Gem City Stove Company, Quincy, Illinois. Has been used for stove plate.

Sample No. 176: Location same as No. 133. Sample taken from bin of Eagle Foundry Company, Belleville, Illinois. Used for stove plate.

Henry County

Sample No. 76: SW. 1/4 sec. 2, T. 17 N., R. 1 E. One-half mile north of Colona siding of Chicago, Rock Island and Pacific Railroad. Worked by C. E. Oberlaender and Company. Sample taken from several channels in 1- to 3-foot pit section. Coarser phase. Extent of deposit 12,000 to 20,000 tons. Formation, wind blown sands and silts capping top of valley wall of Green River. Deposit exceedingly variable in texture. All sands produced are combinations of weathered and primary bond sands.

Sample No. 77: Location same as No. 76. Sample taken from single hole dug in upper 2 1/2 feet of 4-foot section.

Sample No. 83: Location same as No. 76. Sample taken from bin of John Deere Harvester Works, East Moline, Illinois. Used for medium gray iron work.

Sample No. 88: Location same as No. 76. Sample taken from bin of Union Malleable Company, East Moline, Illinois. Sold as "No. 5."

Sample No. 93: SW. 1/4 SW. 1/4 sec. 11, T. 17 N., R. 2 E. One-half mile south of Colona. Unworked deposit. Owner's name not known. Total 4-foot section; 1 foot coarse sharp, 1 foot fine heavy, and 2 feet coarse with medium bond. Sample 40 per cent sharp basal sand and 60 per cent heavy top sand. Total extent 18,000 to 30,000 tons. Formation, wind blown sand on valley flat of Green River. Contains weathered bond.

Sample No. 94: Same location as No. 93. Same section. Sample from heavy layer only.

Sample No. 95: Same location as No. 93. Same section. Sample from several channels in total 4-foot section.

Sample No. 99: Location same as No. 76. Sample taken from bin of Moline Plow Company, Moline, Illinois. Sold as "No. 6." Used for medium gray iron work.

Sample No. 111: N. 1/4 sec. 10, T. 17 N., R. 2 E. Three miles east of Green River siding of Chicago, Rock Island and Pacific Railroad. Adjacent to tracks of Chicago, Rock Island and Pacific Railroad. Unworked deposit. Owner's name unknown. Sample taken from several channels of 3-foot section exposed in roadcut. Extent, 30,000 to 240,000 tons. Locality favorable for similar deposits. Formation, low terrace deposit in valley of Green River. A waterlaid sand containing primarily deposited sand.

Sample No. 112: SE. 1/4 SW. 1/4 sec. 7, T. 17 N., R. 2 E. Three-fourths of a mile southeast of Green River siding of Chicago, Rock Island and Pacific Railroad. Abandoned pit. Mr. H. Stevens, owner. Sample taken from several channels in total 2- to 4-foot section. Extent, 40,000 to 100,000 tons. Formation, wind blown sand on upper terrace of Green River. Contains weathered bond.

Jackson County

Sample No. 182: SW. 1/4 NE. 1/4 sec. 16, T. 9 S., R. 3 W. Adjacent to Sand Ridge siding of Illinois Central Railroad. Unworked deposit. Owner's name unknown. Sample from total 6-foot section. Extent, 60,000 to 480,000 tons. Formation, terrace sand on terrace between Big Muddy and Mississippi rivers. Contains weathered bond but also has some layers containing primary bond. Appears remarkably uniform for such a large waterlaid deposit.

Jo Daviess County

Sample No. 61: SW. 1/4 NW. 1/4 sec. 9, T. 27 N., R. 1 E. One-eighth mile west of Aiken siding of Chicago, Great Western Railroad. Worked by Frank Einsweiler and Sons, Galena, Illinois. Sample taken from several channels in total 3-foot pit section of finer phase. Extent of deposit 24,000 to 40,000 tons. Formation, terrace sands of Mississippi River.

Sample No. 62: Location same as No. 61. Sample taken from several channels in total 2-foot pit section of coarser phase.

Sample No. 63: NW. 1/4 NW. 1/4 sec. 22, T. 27 N., R. 1 E. One mile southwest of Rice Station of Chicago Great Western Railroad. Unworked deposit. Owner's name unknown. Sample from single channel in 12-foot section. Extent, 200,000 to 1,000,000 tons. Formation, wind blown, calcareous silt or loess capping hilltops. Contains primarily deposited bond.

Kane County

Sample No. 2: SE. 1/4 NW. 1/4 sec. 1, T. 40 N., R. 8 E. Adjacent to spur of Chicago and Northwestern Railroad. Worked by G. J. Van Wicklin. Sample taken from partially loaded car. Pit section 3 to 5 feet. Extent, 40,000 to 80,000 tons. Formation, wind blown sands which mantle slope of east valley wall of Fox River.

Sample No. 5: NE. 1/4 SW. 1/4 sec. 3, T. 38 N., R. 8 E. One-fourth mile to North Aurora siding of Chicago and Northwestern Railroad. Worked by Peter Hettinger, North Aurora. Sample taken from several channels in total 4 1/2-foot pit section. Extent, 5,000 to 20,000 tons. Formation, wind blown sand on slope of east valley wall of Fox River.

Sample No. 6: NE. 1/4 SE. 1/4 sec. 33, T. 39 N., R. 8 E. One-third mile north of Sperry Company foundry, North Aurora. Worked by Sperry Company for foundry use. Medium gray iron work. Sample taken from foundry bin. Pit section 2 to 3 feet. Extent, 5,000 to 10,000 tons. Formation, wind blown sand on terrace of Fox River.

Sample No. 7: SW. 1/4 NE. 1/4 sec. 16, T. 42 N., R. 8 E. One mile west of Carpentersville siding of Chicago and Northwestern Railroad. Worked by Frank Vogel. Sample taken from partially loaded car. One- to four-foot pit section. Extent, 8,000 to 30,000 tons. Formation, wind blown sands and silts capping hilltop near crest of moraine.

Sample No. 8: SW. 1/4 NE. 1/4 sec. 15, T. 42 N., R. 8 E. Three-quarters mile north of Carpentersville siding of Chicago and Northwestern Railroad. Worked by Frank Vogel. Sample taken from several channels in several small openings. Pit sections 1 to 4 feet. Extent, 15,000 to 40,000 tons. Formation, wind blown sand mantling slope of valley tributary to Fox River valley.

Sample No. 38: Location same as No. 2. Sample taken from bin of International Harvester Company, Chicago, Illinois. Used for medium gray iron work.

Kendall County

Sample No. 19: NW. 1/4 NE. 1/4 sec. 34, T. 37 N., R. 6 E. One and one-fourth miles south of Plano siding of Chicago, Burlington and Quincy Railroad. Unworked deposit. Owner's name unknown. Sample from several channels in 2- to 3-foot sections exposed in hillside. Bond variable. Extent, 2,000 to 20,000 tons. Locality favorable for similar deposits. Formation, wind blown sand on slopes and ridges.

La Salle County

Sample No. 126: SW. 1/4 NW. 1/4 sec. 14, T. 33 N., R. 2 E. On spur of Chicago, Rock Island and Pacific Railroad. Silica sand pit worked

by Higbee Canyon Sand Company, Ottawa, Illinois. Sample from iron-stained cap rock. Ordinarily sold as steel sand. Bond and permeability tested wet only. Formation, St. Peter sandstone.

Lawrence County

Sample No. 195: NW. 1/4 SW. 1/4 sec. 3, T. 3 N., R. 11 W. One and one-fourth miles east of Lawreneeville siding of Baltimore and Ohio Railroad. Deposit adjacent to Baltimore and Ohio right-of-way. Unworked deposit. Owner's name unknown. Sample taken from several channels in total 3-foot section. Extent, 30,000 to 120,000 tons. Loeality favorable for similar deposits. Formation, wind blown sands on terraee of Wabash River. Contains weathered bond only.

Madison County

Sample No. 172: NW. 1/4 SE. 1/4 sec. 29, T. 3 N., R. 8 W. One mile north of siding. Worked by Commercial Foundry Sand Company, Collinsville, Illinois. Production for light gray iron, brass and aluminum work. Sample taken from several channels in 2-foot lime-free portion of 4-foot pit section. Sample not a grade as produeed but is grade which eould be produced in limited quantity. Deposit variable in texture both vertieally and horizontally. Extent of any one grade impossible to estimate. Sand of all types 20,000 to 60,000 tons. Formation, wind blown sands and silts on slope of east valley wall of Mississippi River. Interbedded textures make any sand produced a eombination of weathered bond sand and a primarily deposited bond sand.

Sample No. 173: Loeation same as No. 172. Sample from several channels in 2-foot scction of ealeareous sand directly overlying the section represented by No. 172. Sample not a produced gradc. Total 4-foot section is worked for a produced grade. Formation, same as No. 172.

Sample No. 175: Location same as No. 172. Coarsest grade produeed. Sample taken from several channels of 3-foot limc-free pit section. Not more than 2,000 tons of this grade available. Formation, same as No. 172.

Marshall County

Sample No. 127: SW. 1/4 NE. 1/4 sec. 4, T. 30 N., R. 2 W. Two miles east of Henry siding of Chicago, Rock Island and Paeific Railroad. Unworked deposit. Owned by Peter Hank. Sample from single dug hole in upper 2 1/2 feet of total 10-foot section. Lower part of section uniform with sample. Extent, 3,000 to 5,000 tons. Loeality favorable for similar deposits. Formation, terraee remnant on east side of Illinois valley.

McHenry County

Sample No. 9: NE. 1/4 NW. 1/4 sec. 34, T. 43 N., R. 8 E. Adjacent to siding of Chicago and Northwestern Railroad. Worked by Garden City Sand Company, Chicago, Illinois. Sample taken from partially loaded car. Total pit section 4 feet. Extent, 50,000 to 100,000 tons. Formation, wind blown sand on Fox River terrace.

Sample No. 21: SW. 1/4 SE. 1/4 sec. 16, T. 43 N., R. 8 E. Adjacent to spur of Chicago and Northwestern Railroad. Unworked as molding sand deposit. Sand is overburden on gravel in pit of Consumer's Gravel Company, Chicago, Illinois. Sample taken from several channels in 2- to 3-foot section of finest phase. Extent, 80,000 to 200,000 tons. Formation, wind blown sand on gravel outwash plain.

Sample No. 22: Location same as No. 21. Sample taken from several channels in 3- to 6-foot section of coarsest phase.

Ogle County

Sample No. 54: S. 1/2 SE. 1/4 sec. 5, T. 25 N., R. 11 E. One mile southwest of Byron siding of Chicago Great Western Railroad. Unworked deposit. Owner's name unknown. Sample taken from 2-foot section exposed in roadcut. Lacking in bond. Surface clay directly overlying might be added to increase bond strength. Extent, 5,000 to 30,000 tons. Locality favorable for similar deposits. Formation, wind blown sands capping east valley wall of Rock River. Contains some weathered bond.

Sample No. 55: W. 1/2 SW. 1/4 sec. 7, T. 23 N., R. 11 E. One-eighth mile east of Honey Creek siding of Chicago, Burlington and Quincy Railroad. Unworked deposit. Owner's name not known. Sample from single dug hole in total 3-foot section. Extent, 60,000 to 120,000 tons. Locality favorable for other deposits. Formation, terrace sands on broad terrace of Kyte River. Wind blown sands containing weathered bond, mantle hill slopes to northeast.

Sample No. 57: W. center W. 1/2 sec. 31, T. 23 N., R. 8 E. Adjacent to paved road five miles south of Oregon siding of Chicago, Burlington and Quincy Railroad. Unworked deposit. Owner's name unknown Sample from several channels in total 2- to 3-foot section exposed in roadcut. Extent, 10,000 to 60,000 tons. Formation, wind blown sand on terrace remnant of Rock River. Sand is derived from St. Peter sandstone and contains weathered bond.

Peoria County

Sample No. 150: NW. 1/4 SE. 1/4 sec. 21, T. 9 N., R. 7 E. Two and one-half miles east of Edwards siding of Chicago, Burlington &

Quincy Railroad. One-eighth mile from Chicago, Burlington & Quincy Railroad right-of-way. Unworked deposit. Owner's name not known. Sample is from upper 3 feet of 10-foot section of uniform texture which is lower part of 25-foot section exposed on west valley wall of Kickapoo Creek. The stratum from which the sample was taken could not be worked alone because of the overburden 15 to 20 feet thick. Extent of total deposit 100,000 to 200,000 tons. Formation, fluvio-glacial sands and silts deposited in still water.

Sample No. 152: Location same as No. 150. Sample from calcareous upper 3 feet of 10-foot section of uniform texture. This stratum overlies that represented by No. 150 and is separated from it by 5 feet of very calcareous silt. An overburden at least 5 feet thick covers the entire section and increases to a maximum of 20 feet back from the section. Extent of deposit estimated on basis of quantity available with 5-foot overburden.

Sample No. 153: NW. 1/4 SW. 1/4 sec. 27, T. 9 N., R. 7 E. Two miles west of Pottstown siding of Chicago, Burlington and Quincy Railroad. Unworked deposit. Owner's name unknown. Sample from several channels in upper 4 feet of 15-foot section of uniform texture. Overburden from 3 to 8 feet. Sample slightly calcareous, some parts of section very calcareous. Extent, 60,000 to 200,000 tons. Formation, fluvio-glacial sands underlying high terrace level of Kickapoo Creek.

Sample No. 154: SW. 1/4 NW. 1/4 sec. 17, T. 8 N., R. 8 E. In south part of city of Peoria. Worked by William Worm. Sample taken from several channels in total pit section. Used for heavy gray iron. Extent, 5,000 tons. Formation, wind blown sand in low dunes on surface of terrace of Illinois River. Occasional dunes are present on terrace from Henry to Peoria. Contains weathered bond.

Pope County

Sample No. 184: NW. 1/4 SE. 1/4 sec. 2, T. 14 S., R. 5 E. One mile south of Brownfield siding of Illinois Central Railroad. Unworked deposit. Owner's name unknown. Sample from uppermost foot of 3-foot section. Extent of deposit of fine sands and silts 180,000 to 1,200,000 tons. Considerable variability in clay and silt content from place to place. Formation, waterlaid fine sands and silts in abandoned river channel.

Sample No. 185: Location same as No. 184. Sample taken from lower 2 feet of 3-foot section.

Sample No. 186: Location same as No. 184. Sample from total 3-foot section in addition to six-inch surface layer, which contains little or no humus.

Sample No. 187: NW. 1/4 NE. 1/4 sec. 15, T. 14 S., R. 6 E. Two and one-half miles south of Homberg siding of Illinois Central Railroad.

Unworked deposit. Owner's name unknown. Sample from several channels in total 3- to 4-foot section. Extent, 5,000 tons. Locality favorable for similar deposits. Formation, low terrace deposits of abandoned river channel.

Sample No. 188: NW. 1/4 SE. 1/4 sec. 4, T. 14 S., R. 6 E. Adjacent to Homberg siding of Illinois Central Railroad. Unworked deposit. On right-of-way of Illinois Central Railroad. Sample from several channels in total 2-foot section. Extent, 5,000 tons. Locality favorable for similar deposits. Formation, wind blown sand in dunes on highest terrace of abandoned river channel.

Sample No. 189: NE. 1/4 NW. 1/4 sec. 2, T. 13 S., R. 5 E. Two and one-half miles south of Brownfield siding of Illinois Central Railroad. Part of deposit mentioned under No. 184. Sample from single dug hole in 3-foot total section. Surface silt not included.

Pulaski County

Sample No. 183: NW. 1/4 NE. 1/4 sec. 22, T. 15 S., R. 1 W. One-half mile south of Pulaski. Sample contains only iron oxide bond. From deposit of no commercial value. Formation, Tertiary sands.

Randolph County

Sample No. 181: SW. 1/4 NE. 1/4 sec. 28, T. 7 S., R. 6 W. Adjacent to Clores siding of Wabash, Chester and Western Railroad. Abandoned pit. Owner's name not known. Sample taken from upper 3 feet of 7-foot section. Extent, 20,000 to 50,000 tons. Formation, interbedded sands and silts on terrace of St. Mary's River. "Vegetable" or reduced clay bond.

Rock Island County

Sample No. 78: W. 1/2 sec. 3, T. 17 N., R. 2 W. Deposit adjacent to siding of Chicago, Rock Island and Pacific Railroad. Worked by Rock Island Molding Sand Company, Rock Island. Sample taken from 2½-foot pit section. Extent of deposit 120,000 to 600,000 tons. Formation, alluvium. Has "vegetable" or reduced clay bond. Deposit subject to the textural variations normal to deposits containing primarily deposited bond.

Sample No. 79: Location same as No. 78. Sample from dug hole in 2-foot section.

Sample No. 84: Location same as No. 102. Sample taken from bin of John Deere Harvester Works, East Moline. Used for light castings and as core filler.

Sample No. 85: Exact locality unknown. Reported to come from small island in Mississippi River. Was used locally at one time. Locally called "Mud Island" sand. Sample taken from remnant in bins of John

Deere Harvester Works, East Moline. Formation, apparently alluvium. Has "vegetable" or reduced clay bond. Bond primarily deposited.

Sample No. 102: NE. 1/4 NW. 1/4 sec. 14, T. 17 N., R. 2 W. One-eighth mile from siding of Chicago, Rock Island and Pacific Railroad. Worked by T. B. and S. S. Davis. Total section 15 to 20 feet. Sample taken from bin of Frank Foundries, Moline. Used for small castings and for core filler. Extent of deposit, 5,000 to 15,000 tons. Formation, wind blown silts on slope of north valley wall of Rock River. Bond primarily deposited. Calcareous except at base of section.

Sample No. 105: SW. 1/4 NW. 1/4 sec. 34, T. 18 N., R. 2 W. On the property of and adjacent to Blake Foundries Specialty Company, Rock Island. Sample taken from lower 3 feet of total 7-foot section. Used for light and medium castings. Formation, alluvium. Contains "vegetable" or reduced clay bond.

Sample No. 106: NW. 1/4 SW. 1/4 sec. 29, T. 18 N., R. 1 E. Adjacent to siding of Chicago, Rock Island and Pacific Railroad. Worked by Rock Island Molding Sand Company. Sample from several channels in total 2-foot section. Extent, 10,000 to 60,000 tons. Formation, sands in terrace remnant of old channel.

Sample No. 110: SE. 1/4 SW. 1/4 sec. 22, T. 17 N., R. 2 W. One and one-fourth miles west of Milan. Adjacent to Chicago, Rock Island and Pacific Railroad right-of-way. Unworked deposit. Owner's name unknown. Sample from single dug hole in 3-foot section. Extent, 9,000 to 20,000 tons. Locality favorable for similar deposits. Formation, fine sands and silts on broad terrace of Rock River.

Sangamon County

Sample No. 156: SW. 1/4 NE. 1/4 sec. 4, T. 17 N., R. 4 W. One-fourth mile northwest of Spaulding siding of Illinois Central Railroad. Unworked deposit. Owner's name unknown. Sample from several channels in 2- to 3-foot section, exposed in roadcut. Extent, 10,000 to 15,000 tons. Formation, wind blown sand capping east valley wall of Sangamon River. Contains weathered bond.

St. Clair County

Sample No. 180: NE. 1/4 SE. 1/4 sec. 7, T. 2 N., R. 8 W. One-eighth mile from Caseyville siding of Baltimore and Ohio Railroad. Owned and worked by O. J. Long, Caseyville. Sample from calcareous lower 6 feet of 18-foot section. Extent, 10,000 tons. Formation, wind blown silt or loess on slope of east valley wall of the Mississippi.

Shelby County

Sample No. 196: T. 10 N., R. 4 W. Two and one-half miles northwest of Fancher. One-half mile east of Kaskaskia River. Forest Howe,

owner. Sample from dug hole in 2½-foot section. Extent, 12,000 tons. Formation, wind blown sand capping hilltop. Contains weathered bond.

Tazewell County

Sample No. 155: NE. 1/4 SW. 1/4 sec. 13, T. 25 N., R. 5 W. Three miles north of Pekin. One-fourth mile east of Chicago, Peoria and St. Louis Railroad right-of-way. Unworked deposit. Owner's name unknown. Sample from several channels in 2- to 4-foot section exposed in roadcut. Extent, 200,000 to 500,000 tons. Locality very favorable for similar deposits. Formation, wind blown sand on terrace of Illinois River. Contains weathered bond.

White County

Sample No. 192: SE. 1/4 SW. 1/4 sec. 8, T. 5 S., R. 10 E. One and one-half miles east of Carmi siding of Big Four Railroad. Unworked deposit. Owner's name unknown. Sample from total 3½-foot section; 1½ feet very heavy, 2 feet open. Extent, 42,000 tons. Several deposits in locality. Formation, wind blown sand in dunes on terrace of Wabash River. Contains weathered bond.

Sample No. 193: NW. 1/4 SE. 1/4 sec. 11, T. 5 S., R. 10 E. Three and one-half miles southeast of Simpson siding of Big Four Railroad. Sample of several channels in total 3½-foot section. Extent, 40,000 to 100,000 tons. Locality favorable for similar deposits. Formation same as No. 192.

Sample No. 194: S. 1/2 sec. 29, T. 3 S., R. 11 E. One and one-fourth miles south of Grayville siding. Unworked deposit. Owner's name unknown. Sample from several channels in 2- to 4-foot section. Extent, 20,000 to 240,000 tons. Locality favorable for similar deposits. Formation, wind blown sand on terrace of Wabash River.

Whiteside County

Sample No. 65: SW. 1/4 NW. 1/4 sec. 25, T. 21 N., R. 5 E. One-eighth mile west of Round Grove siding of Chicago and Northwestern Railroad. Owner, Clare Knox. Lessee, Garden City Sand Company. Sample from upper 5 feet of total 10-foot pit section, calcareous. Extent, 24,000 to 50,000 tons. Formation, wind blown silt or loess capping ridge.

Sample No. 66: Location same as No. 65. Sample from calcareous lower 5 feet of total 10-foot pit section.

Sample No. 68: NE. 1/4 NW. 1/4 sec. 32, T. 21 N., R 4 E. Three miles north of Fenton siding. Deposit adjacent to Chicago, Burlington and Quincy right-of-way. Unworked deposit. Owner, Harry Hanzinga, Fenton. Sample from several channels in 2-foot section exposed in roadcut. Extent, 48,000 to 80,000 tons. Formation, wind blown sand on southeast valley wall of abandoned channel.

Sample No. 69: Location same as No. 68. Sample from several sections at higher level.

Will County

Sample No. 11: S. 1/2 sec. 18, T. 32 N., R. 10 E. One-fourth mile from siding of Wabash Railroad. Worked by Larson and Larson. Sample taken from partially loaded car. Pit section 2 to 4 feet. Extent, 40,000 tons. Formation, sand terrace of Kankakee River. Weathered bond.

Sample No. 12: S. 1/2 sec. 18, T. 32 N., R. 10 E. One-eighth mile west of Wabash Railroad siding. Worked by Riverside Sand Company, Custer Park, Illinois. Sample taken from partially loaded car. From 3-foot pit section. Extent, 20,000 to 60,000 tons. Formation, wind blown sand on terrace of Kankakee River.

Sample No. 13: Location same as No. 12. Sample from several dug holes in 2-foot section. Formation same as No. 12.

Sample No. 15: Location same as No. 12. Sample taken from dug hole in upper 2 feet of 4- to 6-foot section underlying pit sections mentioned under Nos. 12 and 13. Extent, 10,000 to 15,000 tons. Formation, terrace sands of Kankakee River. Contain weathered bond.

Sample No. 39: E. 1/2 sec. 12, T. 33 N., R. 9 E. One-eighth mile east of siding of Chicago and Alton Railroad. Worked by Rockton Molding Sand Co., Rockton, Illinois. Sample taken from several channels in 2½-foot section exposed in roadcut. Extent, 32,000 to 120,000 tons. Formation, wind blown sand mantling slope at east edge of wide flat. Weathered bond.

Sample No. 40: Location same as No. 39. Sample taken from several channels in 2-foot section of second roadcut.

Winnebago County

Sample No. 46: NE. 1/4 sec. 25, T. 46 N., R. 1. E. One mile south of Chicago, Milwaukee and St. Paul Railroad siding. Worked by Rockton Molding Sand Company, Rockton, Illinois. Sample taken from 2-foot pit section. Extent of whole deposit 50,000 to 300,000 tons. Formation, wind blown sands on slope and capping valley wall of Rock River.

Sample No. 47: Location same as No. 46. Sample taken from dug hole in upper 3 feet of 5-foot section. From upper slopes.

Sample No. 48: Location same as No. 46. Sample from 2-foot pit section in abandoned opening.

Sample No. 49: Location same as No. 46. Sample dug from 3-foot pit section by machine. This material is mechanically mixed with No. 46 to form one produced grade.

Sample No. 50: S. 1/2 sec. 24, T. 46 N., R. 1 E. Worked by Rockton Molding Sand Company, Rockton, Illinois. Sample from lower 6 feet of 8-foot pit section. Calcareous. Extent, 5,000 tons. Formation, wind blown silt or loess on slope of south valley wall of Rock River.

FOREIGN MOLDING SANDS USED IN ILLINOIS

Albany, New York, No. 1

Sample No. 180: Decatur Malleable Iron Company, Decatur, Illinois. Used for bond renewal and for small castings.

Albany, New York

Sample No. 103: Rock Island Stove Company, Rock Island, Illinois Used for stove plate.

Sample No. 104: Rock Island Stove Company, Rock Island, Illinois. Used for stove plate.

Bauman, Indiana

Sample No. 25: Houghland and Hardy, Evansville, Indiana. Sample from Greenlee Brothers, Chicago, Illinois.

Sample No. 30: Houghland and Hardy, Evansville, Indiana. Western Foundry Company, Chicago. Light brass and aluminum casting.

Beloit, Wisconsin

Sample No. 24: Greenlee Brothers, Chicago. Used for heavy castings.

Beloit, Wisconsin, "Northwestern"

Sample No. 35: Crane Company, Chicago. Used for medium heavy castings.

Conneaut, Ohio, "Nash"

Sample No. 27: Western Foundry Company, Chicago. Used for slightly heavier work than No. 30.

Bauman, Indiana, and Conneaut, Ohio

Sample No. 28: Half and half mix made for some types of work. Western Foundry Company, Chicago.

Conneaut, Ohio

Sample No. 91: Tri-City Malleable Company, Moline, Illinois. Not suitable for malleable work.

Newport, Kentucky, "Dyeton"

Sample No. 34: Crane Company, Chicago. Used for light work.

Newcastle, Indiana, "Bradford"

Sample No. 33: Crane Company, Chicago. Used for medium weight castings.

Sample No. 36: National Malleable and Steel Casting Company, Chicago. Used for very heavy work.

Ridgeway, Pennsylvania

Sample No. 198: American Refractories Company. Synthetic sand with fire clay bond. Sample sent in.

Zanesville, Ohio

Sample No. 29: Western Foundry Company. Used for heavy castings and for opener with close sands.

Sample No. 32: Western Foundry Company, Chicago. Used for medium work.

Table 1. **Results of tests on Illinois molding sands**[1]

Lab. No.	County[2]	Grade if Used	Screen Analysis												Water Per cent	Bond Strength	Permeability	Per cent Loss Bond Strength at 600° F.	Base
			On 6	On 12	On 20	On 40	On 70	On 100	On 140	On 200	On 270	Through 270	Clay	Total					
139	Adams	Produced (Calcium carbonate present).	....	....	....	.6	2.6	1.6	1.2	2.7	2.4	75.3	13.0	99.4	4	231.6	3.7		
															6	238.3	**3.8**	14 3	4
															8	**254.9**	3.6		
52	Bond	Produced..	....	....	.1	.3	40.3	21.1	8.6	5.1	1.0	4.9	17.6	99.0	4	.....	**83.6**		
															6	**312.3**	69.6		89
															8	276.5	54.5		
53	Bond	Produced..	....	....	.02	.6	39.0	14.2	5.1	4.1	1.1	16.7	18.8	99.62	4		**47.8**		
															6	**235.2**	44.0		19
															8	210.3	37.4		
100	Bond	Produced..	2.0	.5	1.6	4.7	31.8	13.6	10.2	4.2	.9	8.7	21.1	99.3	4	314.2	**92.8**		
															6	**321.5**	89.5		60
															8	306.5	51.2		
166	Bond	Possible...	....	1.0	1.4	4.0	42.8	18.6	8.2	4.6	1.4	3.8	14.0	99.8	4	**302.4**	**92.8**		
															6	289.1	83.5	32 2	82
															8	212.7	56.2		
167	Bond	Produced..	....	.6	.6	3.4	31.0	15.8	9.8	11.0	3.2	7.6	16.0	99.0	4	**336.7**	46.6		
															6	311.1	**48.6**		30
															8	292.7	30.3		
168	Bond	Produced..	....	.2	.4	.8	27.8	15.6	9.2	6.4	.8	10.0	28.0	99.2	4	336.6	77 6		
															6	325.7	**78.8**		121
															8	**346.4**	41.5		
170	Bond	Produced..	....	2.2	4.0	9.8	18.0	8.8	13.8	3.4	.8	13.4	25.0	99.2	4	281.0	66.3		
															6	303.1	**86.7**	4 9	108
															8	**319.0**	76.8		
171	Bond	Possible...	....	.2	3.0	24.6	45.0	1.8	1.0	1.0	.2	4.0	18.4	99.2	4	299.4	**432.0**		
															6	**336.6**	248.6	28 1	378
															8	326.1	152.5		
179	Bond	Produced..	.5	.5	.9	2.0	39.0	26.2	6.4	2.2	.4	4.4	16.4	98.4	4	**290.0**	**104 4**		
															6	278.1	96.4		105
															8	254.7	62.8		
43	Boone	Possible...	....	....	.8	7.2	37.4	11.2	4.6	3.4	1.2	10.4	23.0	99.2	4	.....	.....		
															6	**329.7**	**83.5**		94
															8	325.2	58.3		
113	Bureau	Possible...	....	....	..	1.0	34.6	21.6	11.0	7.2	1.8	12.0	10.0	99.2	4	**231.1**	**43.2**		
															6	185.3	39.2	25.6	23
															8	147.4	26.7		
114	Bureau	Possible...	....	....	....	.6	30.6	25.8	10.4	7.8	2.4	9.4	12.0	99.0	4	**283.2**	**64.2**		
															6	232.3	43.2	19.8	28
															8	174.4	29.9		
115	Bureau	Produced..	....	....	....	.4	26.8	22.4	9.4	5.8	1.8	13.4	19.0	99.0	4	245.8	**50.1**		
															6	**266.9**	41.8		23
															8	251.0	37.4		
116	Bureau	Produced..	....	....	....	1.4	35.6	27.8	10.8	5.0	.6	6.3	11.6	99.1	4	**231.7**	**69.6**		
															6	183.4	54.5	16.5	53
															8	138.5	42.5		
117	Bureau	Possible...	....	....	....	2.0	37.4	25.4	11.0	5.0	.6	5.4	12.4	99.2	4	**212.5**	**71.6**		
															6	171.0	51.2		43
															8	133.5	36.9		
138	Cass	Produced..	....	...	....	.02	14.2	19.2	14.6	7.2	3.3	26.6	14.8	99.92	4	**205.9**	**26.9**		
															6	192.7	19.7	**4 3** gain	2
															8	167.8	15.1		
143	Cass	Possible...	....	....	....	....	29.0	32.6	12.0	7.0	1.0	5.6	12.4	99.6	4	**254.8**	**61.1**		
															6	179.1	47.5	22.8	37
															8	144.5	36.3		
144	Cass	Possible...	....	....	....	....	18.0	22.6	12.8	9.4	2.6	18.2	16.0	99.6	4	**198.8**	19.4		
															6	191.7	**21.1**		1
															8	156.6	18.3		
145	Cass	Possible...	....	....	....	....	12.6	13.8	9.2	11.0	4.6	35.6	12.5	99.3	4	**216.0**	**9.9**		
															6	193.3	9.3		
															8	173.2	9.6		

[1] Bold face figures indicate the best developed bond strength and permeability.
[2] Precise locations are given on pages 12-27.

Table 1. **Results of tests on Illinois molding sands[1]—Continued**

Lab. No.	County[2]	Grade if Used	Screen Analysis											Water Per cent	Bond Strength	Permeability	Per cent Loss Bond Strength at 600° F.	Base Permeability
			On 6	On 12	On 20	On 40	On 70	On 100	On 140	On 200	On 270	Through 270	Clay	Total					
6	Cass	No Value (Calcium carbonate present)...	....	....	....	1.4	16.4	16.4	9.0	9.0	3.2	26.6	17.0	99.0	4 6 8	**196.4** 191.9 189.2	8.1 7.7 **8.3**		9 3
7	Cass	Possible?..	....	....	....	....	11.0	11.8	5.6	4.2	2.4	44.0	20.0	99.0	4 6 8	203.4 **251.1** 231.6	**4.5** 4.3 4.1		4.4
7	Cass	Produced..	....	....	....	.02	13.1	24.0	18.4	15.6	3.3	14.2	9.68	98.3	4 6 8	**186.1** 161.7 132.9	**30.6** 29.5 24.4		26 2
7	Clinton	Possible?..	....	.3	.7	2.4	31.2	11.3	4.8	4.9	1.4	15.9	26.4	99.3	4 6 8	270.6 270.7 **279.3**	**56.8** 41.2 3.8		10 8
7	Cook	Possible...	....	....	....	....	5.0	21.0	20.6	19.0	3.4	7.4	22.6	99.0	4 6 8	312.7 **322.4** 309.3	**54.2** 43.7 33.5		31 4
7	Fayette	Produced..	....	....	....	.06	27.4	25.0	14.1	11.8	2.0	3.9	14.5	98.76	4 6 8	**254.1** 224.4 207.0	**71.6** 53.3 55.7		43.7
1	Fayette	Possible...	....	1.2	1.6	2.8	29.0	19.8	6.7	4.2	2.0	9.8	22.4	99.5	4 6 8	..... **319.2** 288.6	..... 50.0 **57.1**		71 4
2	Fayette	Possible...	....	.2	.2	1.8	37.8	23.0	9.6	8.4	2.0	5.0	11.0	99.0	4 6 8	**329.9** 326.0 314.2	**61.9** 57.3 49.0		55.2
3	Fayette	Produced..	....	1.8	3.8	15.4	45.0	9.0	3.0	2.4	.4	4.2	14.0	99.0	4 6 8	**284.8** 269.4 220.0	**182.9** 135.7 104.4		110.9
4	Fayette	Possible...	....	....	....	....	32.0	22.0	13.2	11.6	1.2	1.8	17.6	99.4	4 6 8	**341.3** 321.7 283.3	**100.3** 92.8 67.8		66 3
5	Fayette	Possible...	....	1.8	2.8	7.0	51.2	7.4	3.2	3.0	1.0	6.0	16.0	99.4	6 8 10	315.3 315.4 **339.9**	50.6 **70.4** 69.4		127.1
6	Fayette	Produced..	....	....	....	1.0	39.8	20.4	6.6	3.8	.4	6.4	20.6	99.0	4 6 8	**320.7** 301.7 295.4	72.0 **80.8** 59.2		49.7
8	Gallatin	Possible...	....	....	....	....	9.0	17.0	13.0	12.0	5.0	26.0	17.0	99.0	4 6 8	**181.5** 167.9 153.4	**18.0** 17.5 15.7	8.8	16.2
9	Gallatin	Possible...	....	....	....	....	11.0	21.4	16.0	13.0	4.0	11.4	22.6	99.4	6 8 10	**333.1** 326.0 320.6	**31.7** 26.7 21.4		26.9
10	Hancock	"No. 2"...	....	....	....	....	.2	1.4	4.0	7.0	6.0	53.0	28.0	99.6	4 6 8	245.0 **282.1** 263.4	**7.5** **7.5** 7.2		7.2
11	Hancock	Produced..	....	....	....	.04	1.8	3.0	3.1	6.8	4.4	64.2	16.4	99.74	4 6 8	255.0 **286.5** 257.0	**6.5** 5.4 4 2		6.4
	Henderson	Produced..	....	.2	.02	.4	11.3	11.3	9.6	11.6	4.6	38.2	11.8	99.02	4 6 8	..... **212.9** 192.1	**12.5** 8.7 10.9		13.4
1	Henderson	Produced..	....	.1	.3	2.0	18.7	12.1	9.3	13.0	5.0	29.1	9.4	99.0	4 6 8	181.5 **197.8** 173.8	**13.2** 13.0 12.6		11.3
1	Henderson	Possible (Calcium carbonate present)...	....	....	....	....	....	.8	1.6	6.6	6.9	78.2	5.0	99.1	4 6 8	147.0 169.5 **172.8**	7.1 **7.2** 6.9		9.0

[1] Bold face figures indicate the best developed bond strength and permeability.
[2] Precise locations are given on pages 12-27.

Table 1. **Results of tests on Illinois molding sands[1]—Continued**

Lab. No.	County[2]	Grade if Used	Screen Analysis												Water Per cent	Bond Strength	Permeability	Per Cent Loss Bond Strength at 600° F	Rem
			On 6	On 12	On 20	On 40	On 70	On 100	On 140	On 200	On 270	Through 270	Clay	Total					
130	Henderson	Produced	....	....	....	2.2	16.0	13.0	7.6	8.2	2.8	31.8	17.6	99.2	4 6 8	225.7 **248.9** 221.9	**19.3** 18.1 15.7	11.4	1
131	Henderson	Possible	....	....	....	....	14.0	15.4	9.0	7.4	3.0	29.4	21.0	99.2	4 6 8	278.2 **281.3** 266.8	21.4 **26.7** 21.1		1
132	Henderson	Possible	....	....	....	4.2	32.0	7.4	3.4	8.4	3.4	18.2	22.2	99.2	4 6 8	..... **298 0** 269.4	..... **23.2** 16.5		1
133	Henderson	"No. 2 Open"	....	....	....	....	5.4	6.6	6.3	11.8	6.2	40.4	22.4	99.1	4 6 8	237.2 **250.0** 241.6	**11.6** 10.4 5.7	21 1	
134	Henderson	"No. 1 Open"	....	....	....	.3	6.2	12.1	20.1	28.3	7.3	17.2	8.0	99.5	4 6 8	**188.4** 149.8 133.6	23.2 **25.6** 21.8		2
142	Henderson	Produced	....	....	....	....	13.8	17.6	11.0	11.0	2.4	26.4	16.0	98.2	4 6 8	**230.0** 216.2 188.4	**18.5** 16.0 14.5		1
176	Henderson	Produced	....	....	....	.1	8.3	12.3	14.9	21.8	7.6	27.9	5.8	98.7	4 6 8	**151.5** 147.9 136.1	**15.9** 14.5 13.7		1
76	Henry	Possible	....	....	....	....	23.0	26.0	13.4	11.2	2.6	12.8	10.2	99.2	4 6 8	**204.7** 179.1 159.6	23.2 **28.5** 24.4		
77	Henry	Possible	....	....	....	1.6	27.0	17.4	7.4	4.6	1.4	21.0	18.0	98.4	4 6 8	189.6 **201.7** 186.6	9.8 12.2 **13.7**		
83	Henry	Produced	....	.1	.06	.3	13.5	17.4	12.6	10.1	2.9	27.3	14.1	98.36	4 6 8	**222.8** 214.8 209.7	15.7 **16.6** 12.6	25 7	
88	Henry	"No. 5"	....	....	....	.2	9.5	15.9	13.5	12.0	5.3	34.6	7.6	98.6	4 6 8	**234.4** 223.1 191.7	9.8 **10.2** 8.1	11.2	
93	Henry	Possible?	....	....	....	2.6	30.0	10.6	15.4	18.2	3.4	7.8	10.6	98.6	4 6 8	**209.8** 175.5 134.4	**35.3** 32.6 29.6	17.9	
94	Henry	Possible?	....	....	....	.4	17.4	17.8	18.0	19.6	4.0	10.0	12.0	99.2	4 6 8	**198.0** 188.4 156.6	**36.4** 34.8 30.9		
95	Henry	Possible	....	....	....	....	5.0	11.8	21.6	28.4	5.8	11.9	14.7	99.2	4 6 8	251.7 **262.4** 228.1	23.2 **27.8** 20.4		
99	Henry	"No. 6"	....	....	....	.4	16.4	25.2	15.6	10.0	3.0	17.2	11.4	99.2	4 6 8	**167.4** 158.7 136.2	23.2 **24.5** 20.0		
111	Henry	Possible	....	....	....	....	3.8	2.2	3.4	5.6	2.5	58.0	23.0	98.5	4 6 8	..... **292.5** 291.0	6.5 **8.0** 7.7	8 2	
112	Henry	Possible	....	....	....	....	2.0	30.8	31.4	15.4	2.4	4.2	13.0	99.2	4 6 8	**269.5** 242.2 188.7	49.7 **55.7** 34.4		
182	Jackson	Possible	....	....	....	....	15.4	17.4	15.6	17.4	5.4	11.2	16.6	99.0	4 6 8	**291.1** 253.4 224.2	**30.0** **30.9** 28.4	19.7	
61	Jo Daviess	Possible	....	....	....	....	2.0	6.0	9.4	26.4	9.0	27.4	19.4	99.6	4 6 8	**317.7** 297.8 287.5	11.2 **12.2** 10.9	17.5	
62	Jo Daviess	Possible	....	....	....	....	23.6	27.0	18.0	15.0	2.6	4.8	8.0	99.0	4 6 8	**220.4** 152.4 130.7	**52.2** 44.0 41.8		

[1] Bold face figures indicate the best developed bond strength and permeability.
[2] Precise locations are given on pages 12-27.

Table 1. **Results of tests on Illinois molding sands[1]—Continued**

County[2]	Grade if Used	Screen Analysis												Water Per cent	Bond Strength	Permeability	Per cent Loss Bond Strength at 600° F.	Base Permeability
		On 6	On 12	On 20	On 40	On 70	On 100	On 140	On 200	On 270	Through 270	Clay	Total					
6 Jo Daviess	Possible (Calcium carbonate present)	....	....	....	....	.4	.5	1.0	4.2	4.2	69.8	19.0	99.1	4	219.2	2.6		
														6	**256.6**	3.3		4 3
														8	227.7	**3.4**		
Kane	Produced	....	....	....	1.6	27.0	5.8	3.6	2.6	1.4	29.4	28.0	99.4	4	310.3	20.6		
														6	**362.0**	**24.1**		13 7
														8	337.3	20.4		
Kane	Possible	....	....	....	5.8	37.4	13.0	5.8	5.0	1.2	11.4	20.0	99.6	4	**262.1**	**48.2**		
														6	257.5	43.2		45.2
														8	245.4	38.6		
Kane	Produced	....	....	....	3.0	31.2	11.4	4.0	3.6	1.8	22.8	21.4	99.2	4	228.5	12.1		
														6	271.8	**20.3**	15.3	27 8
														8	**314.2**	15.9		
Kane	Produced	....	....	....	1.6	36.7	16.2	8.0	6.1	1.2	13.0	16.6	99.4	4	**237.9**	**58.3**		
														6	235.4	53.3		43 2
														8	223.4	40.4		
Kane	Produced	....	....	....	1.4	23.3	15.4	7.6	6.3	1.7	21.4	21.7	98.8	6	245.3	28.8		
														8	**288.7**	**32.6**		35 8
														10	281.5	8.7		
8 Kane	Produced	....	.02	.04	4.2	54.4	9.2	2.5	1.7	.5	11.1	15.1	98.76	4	194.3	**67.7**		
														6	**263.3**	62.7	9.2	37 6
														8	166.5	44.8		
9 Kendall	Possible?	....	....	1.2	2.0	39.4	20.0	6.4	3.4	.4	2.8	23.8	99.4	4	**307.9**	**127.8**		
														6	258.6	96.7		66 3
														8	202.2	53.8		
5 La Salle	Possible	....	....	....	37.8	57.2	2.2	.6	.4	.1	.1	1.2	99.6	1	**66.9**	503.2		
														2	63.2	503.2		
														4	63.6	503.2		
5 Lawrence	Possible	....	....	....	.6	45.0	18.0	5.0	2.2	.4	2.0	26.0	99.2	6	**305.8**	**83.5**		
														8	292.0	71.6	35 5	53 1
														10	245.4	43.2		
Madison	Possible	....	....	....	....	8.4	25.4	13.8	8.8	2.6	28.4	11.6	99.0	4	**235.7**	8.5		
														6	209.5	9.1		9 8
														8	188.5	**9.2**		
Madison	Possible (Calcium carbonate present)	....	....	....	.2	8.2	13.0	8.3	8.7	3.8	45.0	12.4	99.6	4	**267.2**	6.5		
														6	254.5	**9.3**		9.2
														8	231.0	6.7		
Madison	Possible	....	....	....	....	8.0	21.8	12.0	9.6	6.1	25.0	16.0	98.7	4	**259.8**	**22.4**		
														6	255.5	20.2		18 7
														8	232.5	19.4		
Marshall	Possible	....	....	....	....	3.8	15.3	18.7	17.3	2.6	14.2	27.2	99.1	4	.....	31 3		
														6	299.6	**35.7**	8 8	31.2
														8	**306.1**	34.3		
McHenry	Produced	....	....	....	1.6	19.2	17.2	12.2	7.2	11.7	16.8	12.6	98.5	6	194.6	11.1		
														8	231.6	**17.4**		13.5
														10	**251.1**	15.5		
McHenry	Possible	....	....	....	.4	6.4	5.0	5.2	10.0	8.8	38.0	25.6	99.4	4	285.0	**11.3**		
														6	290.6	9.6		8.5
														8	**297.6**	7.6		
cHenry	Possible	....	....	....	.8	19.0	12.8	7.4	10.4	5.0	24.0	19.6	99.0	4	.....	.....		
														6	**301.0**	**18.3**		9.
														8	268.6	15.6		
gle	Possible?	....	....	.3	7.7	67.8	6.6	1.1	.7	.2	6.8	7.9	99.1	4	**150.4**	**125.3**		
														6	110.5	98.3		162.7
														8	.....	71.6		
gle	Possible	....	1.1	1.8	4.2	36.2	17.0	5.4	3.4	.6	19.1	10.6	99.4	4	**253.1**	30.6		
														6	252.7	**37.7**	10.5	17 2
														8	233.6	27.9		

Bold face figures indicate the best developed bond strength and permeability.
Precise l: cations are given on pages 12-27.

Table 1. **Results of tests on Illinois molding sands[1]—Continued**

Lab. No.	County[2]	Grade if Used	Screen Analysis												Water Per cent	Bond Strength	Permeability	Per cent Loss Bond Strength at 600° F	Base
			On 6	On 12	On 20	On 40	On 70	On 100	On 140	On 200	On 270	Through 270	Clay	Total					
57	Ogle	Possible	....	....	.04	7.6	59.0	4.0	1.0	.1	.1	7.0	20.0	99.2	4 6 8	**290.0** 265.9 278.9	**156.6** 100.3 89.5		189
150	Peoria	Possible	....	....	....	....	.8	5.0	22.6	38.6	6.8	15.0	10.6	99.4	4 6 8	**141.8** 136.9 128.0	**21.6** 20.4 **21.6**	**2.0** gain	20
152	Peoria	Possible (Calcium carbonate present). .	....	....	....	....	.7	2.6	11.1	32.6	10.6	35.8	5.0	98.4	4 6 8	127.9 **140.9** 140.8	13.4 **14.9** **14.9**		1
153	Peoria	Possible (Calcium carbonate present). .	....	....	....	....	1.6	6.4	13.2	25.0	6.8	36.8	9.0	98.8	4 6 8	151.6 **157.4** 147.1	9.3 9.6 **9.8**	16.9	1
154	Peoria	Possible	....	....	.6	22.2	55.3	3.8	1.6	1.8	.6	1.4	11.6	99 0	4 6 8	280.5 **284.9** 185.7	216.0 **251.6** 106.6		2
184	Pope	Possible	....	....	....	.1	6.2	9.0	8.0	9.6	4.6	34.6	27.2	99.3	4 6 8 10	138.4 141.5 168.0 **183.8**	3.6 3.9 5.4 **6.8**		
185	Pope	Possible	....	....	....	....	7.8	11.2	6.8	8.4	22.4	21.8	20.2	98.6	8 10 11	268.9 290.2 **300.0**	12.7 13.7 **14.4**		
186	Pope	Possible	....	....	....	....	6.4	10.6	6.8	7.2	2.6	24.4	40.6	98.6	6 8 10 12	181.2 207.9 219.2 **220.9**	3.9 7.4 9.4 **10.2**	4.8	
187	Pope	Possible	....	3.0	15.4	28.4	18.2	6.8	4.4	4.0	1.0	3.6	14.4	99.2	4 6 8	**273.8** 249.6 233.7	**208.8** 156.6 104.4		
188	Pope	Possible	....	....	....	....	47.0	18.4	5.2	2.0	.2	4.0	22.6	99.4	6 8 10	**282.2** 270.0 242.3	**69.6** 62.6 41.2		
189	Pope	Possible	....	....	....	.2	1.4	.6	1.8	.5	1.4	54.7	38.4	99.0	4 6 8	158.2 212.0 **214.9**	1.1 1.5 **1.7**		
183	Pulaski	No value	....	....	....	....	.6	2.8	23.0	54.0	5.4	3.4	10.0	99.2	4 6 8	**188.0** 143.9 116.4	**41.8** 36.8 33.4	21.5	
181	Randolph	Possible	....	....	....	1.4	1.0	1.2	3.4	15.0	7.8	43.2	26.1	99.1	6 8 10	199.1 **241.4** 226.3	6.6 7.3 **9.6**		
78	Rock Island	Produced	....	....	....	....	5.1	9.4	18.5	22.8	9.6	26.0	7.4	98.8	4 6 8	190.8 197.2 **199.1**	**10.3** **10.3** 10.0	9.3	
79	Rock Island	Possible	....	....	....	2.4	8.8	7.6	11.4	17.8	5.6	25.4	20.0	99.0	4 6 8	..... 203.7 **213.4**	14.3 **14.5** 11.0		
84	Rock Island	"Blackhawk" (Calcium carbonate present). .	....	.1	.04	1.3	7.5	4.2	4.8	11.0	7.7	57.8	4.7	99.14	4 6 8	151.9 156.3 **160.7**	8.0 **8.4** **8.4**		
85	Rock Island	"Mud Island"	....	.1	.3	.3	2.7	13.5	21.9	17.6	3.8	24.2	14.8	99.2	4 6 8	241.8 **270.4** 255.0	**18.1** 16.9 15.5	14.	
102	Rock Island	"Blackhawk" (Calcium carbonate present). .	....	....	....	....	.6	.8	1.2	4.2	4.4	78.8	9.7	99.7	4 6 8	181.3 **197.8** 173.8	4.1 4.4 **4.7**	1 gai	

[1] Bold face figures indicate the best developed bond strength and permeability.
[2] Precise locations are given on pages 12-27.

Table 1. **Results of tests on Illinois molding sands[1]—Continued**

County[2]	Grade if Used	Screen Analysis												Water Per cent	Bond Strength	Permeability	Per cent Loss Bond Strength at 600° F.	Base Permeability
		On 6	On 12	On 20	On 40	On 70	On 100	On 140	On 200	On 270	Through 270	Clay	Total					
Rock Island...	Possible...	....	....	....	.02	1.1	16.0	27.0	22.9	4.0	16.7	11.2	98.92	4	**208 6**	**20.2**		20.5
														6	202.0	17.4		
														8	183.3	15.9		
Rock Island...	Possible...	....	1.2	5.6	20.0	35.4	7.4	3.4	1.8	.8	6.2	17.6	99.4	4	209.9	32.2		50.1
														6	**232.3**	38.6		
														8	215.8	**45.6**		
Rock Island...	Possible...	....	....	....	1.2	9.8	7.1	7.4	11.8	19.8	33.8	8.2	99.1	4	236.4	4.4		8.4
														6	**271.4**	4.6	7.7	
														8	261.8	**4.7**		
Sangamon.....	Possible...	....	....	....	5.0	47.0	17.6	7.0	4.4	.4	1.4	16.2	99.0	4	**321.3**	**147.7**		92.4
														6	301.3	104.4		
														8	243.6	92.8		
St. Clair.....	Possible (Calcium carbonate present)...	....	....	....	....	.2	.2	.2	.8	.8	89.0	8.2	99.4	4	145.0	4.3		5.1
														6	**186.0**	4.5	5.0	
														8	172.6	**4.7**		
Shelby.....	Possible...	....	....	....	11.4	48.8	7.4	3.2	2.8	.6	.8	24.6	99.6	6	361.6	**188.3**		232.0
														8	358.2	98.6	25.0	
														10	**370.2**	124.0		
Tazewell.....	Possible...	....	....	....	.6	15.2	19.0	15.2	9.2	1.6	13.8	24.6	99.2	6	238.7	22.7		31.7
														8	**252.4**	**26.1**	4.1	
														10	215.9	19.2		
White.....	Possible...	....	....	....	....	24.6	33.4	12.2	5.4	.6	4.0	19.0	99.2	4	**306.9**	**70.2**		33.3
														6	284.3	63.9	21.8	
														8	254.4	45.8		
White.....	Possible...	....	....	....	....	23.2	23.2	18.2	15.2	2.4	3.8	11.0	97.0	4	**247.7**	**46.8**		43.9
														6	210.6	39.3		
														8	151.9	40.2		
White.....	Possible...	....	....	....	....	7.0	22.0	23.0	21.4	4.4	5.0	16.6	99.4	4	315.9	**42.4**		31.3
														6	**323.3**	41.2	14.5	
														8	283.7	37.9		
Whiteside.....	Possible (Calcium carbonate present)...	....	....	....	....	11.0	18.0	13.4	14.0	5.4	30.8	6.8	99.4	4	**154.1**	12.2		16.4
														6	138.3	12.9		
														8	143.3	**13.4**		
Whiteside.....	Possible. (Calcium carbonate present)...	....	....	....	....	11.0	11.8	8.8	13.0	7.0	39.2	8.2	99.2	4	**247.4**	8.1		13.6
														6	172.2	9.0	32.2	
														8	154.2	**10.0**		
Whiteside.....	Possible...	....	....	....	....	3.9	13.0	12.8	23.8	8.2	26.0	12.2	99.9	4	275.6	**15.3**		14.9
														6	**322.9**	14.7		
														8	302.4	13.6		
Whiteside.....	Possible...	....	....	....	....	2.2	10.8	17.0	25.0	8.2	20.6	15.4	99.2	4	**245.0**	13.7		15.5
														6	222.6	**14.1**		
														8	196.1	13.9		
Will.....	Produced..	....	....	....	.6	19.2	19.0	13.2	17.2	6.2	12.2	11.2	98.8	4	**241.9**	**32.2**		27.9
														6	212.2	28.1		
														8	165.0	23.4		
Will.....	Produced..	....	....	....	.8	19.0	16.0	11.9	15.6	5.2	11.6	19.0	99.1	4	162.1	21.5		14.1
														6	**166.2**	**23.4**	13.9	
														8	136.9	22.0		
Will.....	Produced..	....	....	....	....	12.8	14.2	15.8	10.4	8.4	28.8	9.0	99.4	4	131.7	11.0		14.4
														6	**133.7**	12.6		
														8	127.3	**13.6**		
Will.....	Possible...	....	....	....	.7	51.5	23.3	6.4	4.2	.5	.6	11.8	99.0	4	**267.4**	**139.2**		99.9
														6	200.2	96.4		
														8	124.4	67.8		
Will.....	Possible...	....	.2	1.8	6.4	38.0	13.4	6.6	4.6	1.0	7.0	20.0	99.0	4	.....	.....		88.6
														6	**253.2**	**72.4**		
														8	248.0	51.2		

[1] Bold face figures indicate the best developed bond strength and permeability.
[2] Precise locations are given on pages 12-27.

Table 1. **Results of tests on Illinois molding sands[1]—Continued**

Lab. No.	County[2]	Grade if Used	Screen Analysis												Water Per cent	Bond Strength	Permeability	Per cent Loss Bond Strength at 600° F.	Base Permeability
			On 6	On 12	On 20	On 40	On 70	On 100	On 140	On 200	On 270	Through 270	Clay	Total					
40	Will	Possible	....	....	.4	4.4	33.0	16.0	7.0	5.4	7.0	6.8	19.0	99.0	4	243.9	**79.8**		
															6	**270.1**	73.9	5.1	87
															8	237.4	36.8		
46	Winnebago	Possible	....	....	....	.4	25.6	27.6	8.8	7.0	.8	13.0	16.8	99.2	4	**319.0**	**50.1**		
															6	305.0	41.8		52
															8	299.5	33.9		
47	Winnebago	Possible	....	....	....	.3	29.0	17.0	8.0	7.0	1.6	12.8	22.8	98.5	6	308.6	14.0		
															8	316.7	16.2		36
															10	**338.4**	**17.9**		
48	Winnebago	Possible	....	....	....	.2	10.8	8.2	5.4	4.6	2.4	40.2	27.6	99.4	4	.....	6.0		
															6	177.6	9.4		13
															8	**184.3**	**10.6**		
50	Winnebago	Possible (Calcium carbonate present)	....	....	....	....	3.0	2.8	2.4	5.8	5.0	69.4	11.0	99.4	4	**258.0**	**4.4**		
															6	243.3	4.2		5
															8	231.9	3.9		

[1] Bold face figures indicate the best developed bond strength and permeability.
[2] Precise locations are given on pages 12-27.

Table 2. **Results of tests on imported sands used in Illinois**[1]

Lab. No.	Location[2]	Grade if Used	Screen Analysis												Water Per cent	Bond Strength	Permeability	Per cent Loss Bond Strength at 600° F.	Base Permeability
			On 6	On 12	On 20	On 40	On 70	On 100	On 140	On 200	On 270	Through 270	Clay	Total					
03	Albany, N.Y..	Produced	....	....	....	.5	6.7	7.4	13.9	21.5	7.5	22.1	19.6	99.2	4 6 8	145.3 **171.0** 148.4	8.9 13.3 **13.8**	8.9	15 2
04	Albany, N.Y..	Produced	....	....	....	....	1.5	4.9	8.8	21.4	13.7	37.4	11.2	98.9	4 6 8	..... **164.8** 153.6	10.0 11.6 **12.3**	**2 6** gain	9.6
50	Albany, N.Y..	"No. 1"...	....	....	....	.2	1.3	2.9	9.5	29.0	15.9	34.4	5.9	99.1	4 6 8	140.3 144.2 **146.0**	**15.5** 13.7 14.2		14 9
25	Bauman, Ind..	Produced	....	....	....	....	.06	.04	.02	.04	.04	72.8	24.8	97.8	6 8 10	240.9 **263.7** 247.6	2.0 2.2 **2.8**	6 2	3.1
0	Bauman, Ind..	Produced	....	.02	.02	.04	.4	.7	1.3	5.5	4.9	70.2	15.2	98.28	4 6 8	165.3 202.2 **207.6**	2.8 3.7 **4.2**	2.3	8 9
4	Beloit, Wis....	Produced	....	....	.04	2.6	41.3	16.9	6.6	3.9	.1	13.4	13.0	97.84	4 6 8	**233.2** 220.2 171.0	**45.7** 34.8 18.3		40 9
5	Beloit, Wis....	"North-western"	....	.06	.1	1.1	19.5	8.9	4.3	3.0	1.3	33.2	28.2	99.66	4 6 8	264.9 270.8 **303.7**	17.3 16.3 **30.6**		11 1
7	Conneaut, Ohio	"Nash"	....	.4	.3	.5	3.9	8.0	26.1	24.8	3.7	20.8	10.1	98.6	4 6 8	..... **151.1** 147.8	11.7 16.2 **19.0**	5 4	16.1
8	Bauman, Ind.. Conneaut, Ohio	Foundry Mix.....	....	.02	.1	.2	1.4	3.5	10.8	9.1	1.9	59.3	12.6	98.92	4 6 8	..... 168.5 **177.2**	3.9 4.6 **5.3**		5 3
1	Conneaut, Ohio	Produced	....	....	....	.04	1.2	2.6	4.4	11.1	6.4	60.8	13.0	99.54	4 6 8	..... **254.2** 228.1	..... **7.7** 7.3		6 2
4	Newport, Ky..	"Dyeton"	....	.06	....	.04	.07	2.2	2.8	7.0	5.6	59.0	21.3	98.7	4 6 8	188.4 204.0 **233.8**	3.3 4.0 **4.5**		7.2
3	Newcastle,Ind.	"Bradford"	11.7	1.9	5.0	3.4	18.6	7.8	5.6	5.3	1.4	17.7	20.7	99.1	4 6 8	294.2 301.7 **316.2**	12.5 16.5 **30.7**		35.4
6	Newcastle,Ind.	"Bradford"	2.6	2.2	3.9	8.7	26.0	7.9	4.8	4.6	1.6	16.8	19.4	98.5	4 6 8	..... 330.3 **351.9**	44.8 58.3 **64.3**	37.3	75.0
7	Ridgeway, Pa.	Produced	....	....	....	18.0	50.0	6.0	2.6	3.0	.4	7.4	12.0	99.4	4 6 8	149.0 151.7 **165.6**	25.5 52.4 **61.9**	11.6	23.0
9	Zanesville,Ohio	Produced	....	.6	1.9	9.8	49.8	8.6	3.0	1.1	2.4	11.4	11.2	99.8	4 6 8	**231.3** 197.4 135.8	**77.5** 63.2 35.1	33.3	142.4
	Zanesville,Ohio	Produced	....	.7	.6	1.9	18.4	10.7	6.7	5.7	2.7	35.6	16.1	99.1	4 6 8 10	145.4 166.7 202.1 **220.4**	**20.4** 15.9 11.1 **9.7**		16.1

[1] Bold face figures indicate the best developed bond strength and permeability.
[2] For further information regarding location, see pages 28 and 29.